Peer Review Report—ID 286 Kemp's Ridley Sea Turtle 5-Year Review

Peer Reviewers:

Charles Caillouet, Jr., Ph.D., National Marine Fisheries Service retired

Laura Sarti, Ph.D., National Commission of Protected Natural Areas

Jeffrey Schmid, Ph.D, Conservancy of Southwest Florida

Donna Shaver, Ph.D., National Park Service

Kimberly Reich, Ph.D., Texas A&M University at Galveston

Thane Wibbels, Ph.D., University of Alabama at Birmingham

All non-substantive edits were incorporated where appropriate and are not repeated here. Commenter numbers below do not represent the sequence of peer reviewers listed above, and several commenters only had minor edits, which were all incorporated. Thus, the number of commenters below do not equal six.

Commenter 1.

Section 2.2.1

Reference criterion no. 7
Comment: 'Why are just TX and LA singled out since tag returns suggest the eastern Mississippi Delta has recently been identified as critical habitat due to strandings?'

Section 2.3

Sentence: Nesting in large aggregations may be advantageous for a variety of reasons, including mate finding and enhancing the survival of eggs and hatchlings due to predator swamping (Bernardo and Plotkin 2007).

Comment: Would it be the arribada aggregation or having a primary nesting beach that is more important for mate finding?

Sentence: Historical abundance estimates are unknown, but information suggests they were abundant (see discussion below).

Comment: With the exception of anecdotal historical estimates gleaned from the 1947 Herrera film regarding the potential number of turtles in a single arribada at that time.

Section 2.3.2.5

Sentence: An estimated 100 adult Kemp's ridley sea turtles were found stranded along the Tamaulipas coast during the month of March 2007 and suspected to be from the shark fishery (P. Burchfield, Gladys Porter Zoo, personal communication, 2007).

Comment: My recent discussions with Jaime Pena suggest similar mortality during April of 2015.

Section 2.3.2.5
Add sentence: Preliminary data suggests that long-term changes in temperature is impacting the reproductive physiology of the Kemp's ridley, including nesting phenology and hatchling sex ratios (Bevan and Wibbels, unpublished data).

Section 3.2
Sentence: Based on the best available information, NMFS recommends that the Recovery Priority Number be changed from '5' to a '1.'

> *Comment*: I totally agree with NMFS re-classification due to the unexplained change in the recovery trajectory since 2010, particularly in light of the decline over the past 2 nesting seasons. I would encourage FWS to respond accordingly and enhance concern until we understand the causal basis for the change in the recovery trajectory. I also encourage FWS to maintain support at the primary nesting beach.

Section 4.0
Sentence: assess bycatch in gillnets in the Northern Gulf of Mexico and State of Tamaulipas, Mexico, to determine whether modifications to gear or fishing practices are needed.

> *Comment*: And potentially Veracruz?

Commenter 2

Section 2.2
Reference criterion no. 5

> *Comment*: The number of hatchlings releaased depend more on the increase of nests to be protected than the reduction of the predation itself. The predation rate in Rancho Nuevo has grossly been around 5-10% of nests in situ.

Section 2.3
Reference Figures 1-3

> *Comment:* Provided updated data and suggestions to change map.

Commenter 3

Global comment: Confusion with the term "juvenile" depending on which life history model is used. Suggest using "immature" or differentiate between pelagic/oceanic and neritic stages.

Section 2.2.
Reference criterion no. 7

> *Add sentence*: Available data indicate pelagic juveniles inhabit the oceanic waters of the Gulf of Mexico and northwest Atlantic Ocean, while neritic juveniles inhabit coastal waters of the northern Gulf and U.S. Atlantic.
> *Comment*: What about the eastern Gulf? A number of studies have identified the west coast of Florida as providing vital developmental habitat.

Section 2.3.1

Sentence: Sightings in the Mediterranean Sea have increased, which may be due to misidentified loggerhead sea turtles, increased hatchling production at the nesting beaches, or a migration expansion by the Kemp's ridley to exploit valuable foraging grounds in the region (Tomás and Raga 2008).

> *Comment*: Based on very small sample size, one ridley in 1929 vs. four ridleys between 2001-2006. Witt et al. 2007 provide a much more convincing argument with increased strandings in the British Isles and France.

Sentence: However, juveniles also ventured into deeper water where they remained for extended periods of time suggesting habitat preference may differ among years (Seney and Landry 2011).

> *Comment*: Perhaps there was a red tide bloom or some other environmental perturbation for coastal TX-LA in 2006 that caused this seemingly anomalous behavior.

Sentence: Based on known size-at-age head-started Kemp's ridleys, Snover *et al*. (2008) estimated that neritic juveniles transition to subadult stage at about 4.3 years of age and at 52.2 cm SCL.

> *Commen*t: The terms "juvenile" and "subadult" are confusing in this sentence as subadult has not been previously defined. It appears "subadult" is referring to pubertal turtles.

Sentence: Further studies are needed to sample nesters and nests across years to improve the genotyping methodology and enable quantification of population parameters such as number of nests per female and inter-nesting interval (Frey *et al.* 2014).

> *Comment*: It should be stressed that this parameter is vital in assessing recovery and accurate estimates are needed for listing criteria.

Sentence: If this conclusion holds, the rapid population increase in the Kemp's ridley over one or two generations will likely prevent any negative consequence in the genetic variability of the species.

> *Comment*: What is the generation time?

Delete sentence: Attempts to associate juvenile Kemp's ridleys with a specific substrate type have mostly failed because the turtles apparently are flexible or indifferent to subtle habitat distinctions, both within and among habitats.

> *Comment*: This same comment was made in a draft of the revised recovery plan and, as indicated in my review of that document, I strongly disagree. See edits. Add sentences: However, none of these studies have described the amount of time turtles spend using these habitats or characterized all the habitats available to turtles within the respective study areas. Estimates of resource use and availability are necessary to test for habitat preferences (Schmid 2000, Schmid *et al.* 2003) and to subsequently identify coastal foraging habitats that are essential to the recovery of the species (Thompson et al. 1990, USFWS and NMFS 1992 and herein). Accordingly, live bottom (sessile invertebrates attached to hard substrate) has been documented as a preferred habitat of neritic juveniles in the coastal waters of western Florida and this benthic community has not been identified in any previous descriptive accounts of habitat use (Schmid 2000, Schmid *et al.* 2003, Schmid and Braichivich 2006). Furthermore, the preference for nearshore live

bottom habitat has important implications for offshore winter habitat use by neritic juveniles and adults (Schmid and Witzell 2006).

Sentence: Recent population abundance, based on nests and hatchling recruitment, was estimated by Gallaway *et al.* (2013, in press). They estimated the female population size for age 2 and older in 2012 to be 188,713 (SD = $\underline{+}$32,529). Assuming females comprise 76% (sex ratio = 0.76; TEWG 1998, 2000) of the population, they estimated the total population of age 2 years and over at 248,307. Based on the number of hatchlings released in 2011 and 2012 (1+ million) and recognizing mortality over the first two years is high, Gallaway *et al.* (2013, in press) thought the total population, including hatchlings younger than 2 years, may exceed 1 million turtles.

> *Comment*: I would urge caution in reporting hypothetical numbers such as these based on model scenarios. This information would be better suited after discussing the traditional metric for population trends (i.e., nest numbers)

Sentence: However, caution is warranted on interpreting the results, given the model is fitted to nest counts only and does not account for impacts to the youngest age classes and variability or changes in demographic parameters, such as proportion of adults nesting (Heppell, S., OSU, unpublished data 2015).

> *Comment*: The same applies to the Gallaway et al. estimates

<u>Section 2.3.2.1</u>

Sentence: Declines in the number of nests reported in 2010 at Tamaulipas, Mexcio, may be attributed to the DWH oil spill; however, other plausible explanations for the decline include environmental variants or alternate-year nesting oscillation (Caillouet 2011), or density-dependent factors (e.g., habitat carrying capacity) that may be limiting population growth (Caillouet 2014; Gallaway *et al.* 2013).

> *Comment revision*: Declines in the number of nests reported in 2010 at Tamaulipas, Mexcio, have been attributed to the DWH oil spill but the sequence of events is out of sync to support this claim. As indicated in an earlier section, females migrate to nesting beaches in late winter with mating occurring in late-March through mid-April. The DWH event began on April 20, 2010 so the cause for the decline in nesting in 2010 would have occurred prior to the oil spill. More plausible explanations for the decline include environmental variants or alternate-year nesting oscillation (Caillouet 2011), or density-dependent factors (e.g., habitat carrying capacity) that may be limiting population growth (Caillouet 2014; Gallaway *et al.* 2013).

Sentence: Monitoring the number of nesting females and registered nests during each nesting year will be vital in determining population trajectory as a result of the oil spill (Bjorndal *et al.* 2011).

> *Comment*: What about the Ixtoc oil spill in Bay of Campeche that began in June1979 and continued through March 1980. This spill was comparable in magnitude and directly impacted the nesting beaches.

Sentence: Global warming is an anthropogenic factor that will affect Kemp's ridley habitat and biology.

Comment: This is a rather strong statement to lead off the paragraph. There is evidence of global warming prior to human civilization so this phenomena is not strictly an abthropogenic factor.

Section 2.3.2.3

Paragraph: Red tide (*Karenia brevis*) blooms have been associated with a harmful impact on numerous marine species, including sea turtles (Fauquier *et al.* 2013; Perrault *et al.* 2014). Immature Kemp's ridleys were captured after red tide blooms and all tested positive for brevetoxin (Fauquier *et al.* 2013) Brevetoxin concentrations were significantly higher (by 59%, P = 0.04) for wild-caught Kemp's ridleys exposed to red tides compared to turtles sampled between red tide events (Perrault *et al.* 2014). Brevetoxins, a potent neurotoxin, are produced with the mass accumulation of *Karenia brevis* and can lead to major neurological damage and mortality (Fauquier *et al.* 2013). Although red tide blooms can occur naturally, their frequency and persistence is increasing due to nutrient and chemical run off associated with human activities (Heisler *et al.* 2008).

Comment revision: Blooms of the harmful algae *Karenia brevis*, referred to as "red tide", impact numerous marine species, including sea turtles (Fauquier *et al.* 2013; Perrault *et al.* 2014). Brevetoxins, a potent neurotoxin, are produced with the mass accumulation of *Karenia brevis* and can lead to major neurological damage and mortality. Immature Kemp's ridleys were collected after red tide blooms in western Florida and tested positive for brevetoxin (Fauquier *et al.* 2013) Brevetoxin concentrations were significantly higher (by 59%, P = 0.04) for Kemp's ridleys captured during red tide events compared to turtles sampled between events (Perrault *et al.* 2014).

Sentence: Although red tide blooms occur naturally, their frequency and persistence may be increasing due to nutrient and chemical run off associated with human activities (Heisler *et al.* 2008).

Comment: There is considerable debate regarding this statement given the lack of a strong correlation.

Commenter 4

Section 1.2.4

Comment: Because the only previous listing in this review history was in 1970 and it was "Endangered", there must be a missing part of the review history in which it was changed to "endangered throughout its range" before 1985, so that it could be retained in 1985.

Section 2.1.

Comment : As I understand it, the DPS policy under the ESA is not applicable to Kemp's ridley because it has only one distinct population throughout its range, and therefore does not qualify for designations of DPSs. This should be explained in the 5-yr review, probably under item 2.1

Section 2.1.2 and 2.1.3.

Comment: Consider changing to "Not Applicable"

Section 2.2.1

Reference criterion no. 1

Comments: The designation “Main nesting beaches” would be a better designation than “primary nesting beaches” for Rancho Nuevo, Tepehuajes, and Playa Dos. There can be only one “primary” nesting beach, and it has long been Rancho Nuevo (since 1947), the epicenter of nesting. The other two beaches can only be “secondary” and “tertiary”, depending on their numbers of nests. However, I realize that published recovery objectives in NMFS et al. (2011) cannot be changed by this 5-yr review, but NMFS et al. (2011) can be revisited and revised after this 5-yr review is published. There is also an important disconnect between this Recovery Objective and Figures 1 and 2, which depict total numbers of nests for all beaches in Tamaulipas, not just the three beaches listed here. This disconnect causes confusion to readers who are unfamiliar with demographic modeling of the Kemp’s ridley population, which has been limited to the three index beaches listed here. Figures 1 and 2 also do not show “proportions” of total nests. They show various class intervals of annual numbers of nests on a geometric scale. This should be corrected in legends for these figures. Was this for all nesting beaches in Mexico, all beaches in Tamaulipas, or just the three index beaches listed in item 1 above?

Reference criterion no. 2

Comment: Were these released from the three index beaches, from all beaches in Mexico, or from all beaches in Tamaulipas?

Reference criterion no. 3

Comment: Are all of these beaches in Mexico protected by a “similar legally protective designation or mechanism?” Or just some of them; if just some of them, which ones?

Reference criterion no. 4

Comment: The designation “Main nesting beaches” would be a better designation than “primary nesting beaches” for Rancho Nuevo, Tepehuajes, and Playa Dos. A table should be included in the 5-yr review listing all known nesting beaches, at the very least all those in the western Gulf of Mexico. In the past, some nesting beaches have been called “camps.” Various other designations related to locations of communities, ranches, barras, or streams have been used. Clarifications are needed.

Reference criterion no. 6

Comments: Is this meant to apply only to Mexico’s trawl fisheries, or to U.S. and Mexico trawl fisheries? Clarify. In the U.S., was the observed 2011 TED compliance level the same in the northwest Atlantic as is was in the Gulf of Mexico, or did it differ in these two areas? If it differed, what were the percentages for each area? In the U.S. portion of the Gulf of Mexico, was compliance the same in all areas, by month, or was it different among areas within the Gulf? What was the compliance level in Mexico in 2011? Was it 50% too? U.S. TED compliance probably was not a good criterion to be applied to Mexico if it was only 50% in 2011. What were the observed TED compliance levels in the U.S. and Mexico in 2010, the year of the Deepwater Horizon oil spill?

Reference criterion no. 7

Comments: Please identify and list in this 5-yr review which specific vital rate data are expected to be provided by in-water population monitoring at index sites. Has any evidence of population trends been acquired so far from in-water studies that have been conducted ? Please review the literature and other in-water monitoring data sources, and summarize the results so far. The existing surveys mentioned in this paragraph have been ongoing for quite a long time; include the years in which each of these surveys has been ongoing, and list the kinds of data they have been providing over these years. SEAMAP surveys are also conducted in the U.S. portion of the Gulf of Mexico, and should be mentioned here. There also exist various stock assessments of prey species in the U.S. portion of the Gulf of Mexico, as well as shrimping bycatch surveys, and these should be mentioned here and cited in the text and References. North-South and South-North migrations along the U.S. Atlantic coast are well known and studied, but what is the level of contribution to the overall Kemp's ridley population of Kemp's ridleys that escape into the Atlantic? What evidence is there to show that they contribute significantly to the overall population? Fewer than 20 Kemp's ridleys tagged in the Atlantic have been documented nesting on Gulf of Mexico beaches over the years (Caillouet et al. *in press*): this should be mentioned in the 5-yr review, and its source cited in the text and References:Caillouet, C.W., Jr., D.J. Shaver, and A.M. Landry, Jr. *in press*. Kemp's ridley sea turtle (*Lepidochelys kempii*) head-start and reintroduction to Padre Island National Seashore, Texas. Herpetological Conservation and Biology.

Section 2.3

Sentence: Given the recent downturn in annual nests numbers in Mexico, to determine whether we have met downlisting criterion number 1, the age structured model used for population projection completed for the last recovery plan (NMFS *et al.* 2011) was updated for this 5-year review (Heppell. S.,Oregon State University (OSU), unpublished data 2015; NMFS award NA110AR4320091).

Comment: This is extremely important. Details of Heppell's updated age structured model used for population projection in this 5-yr review must be included in this review, along with a discussion of the much improved stock assessment models applied by Gallaway et al. (2013), Gallaway and Caillouet (2014), and Gallaway and Gazey (2014). These new Kemp's Ridley Stock Assessment models (adapted to AD Model Builder), incorporated (for the first time for any demographic model of a sea turtle population) a time series of annual instantaneous shrimp trawling mortality of Kemp's ridleys, estimated from a time series of annual shrimping effort (by the U.S. fleet in the Gulf of Mexico) provided by the NMFS Galveston Laboratory. Since 1990, shrimp trawling has been identified as the most important anthropogenic cause of sea turtle mortality. Did Heppell's updated model, used as a guide in this 5-yr review, incorporate a time series metric of shrimping related Kemp's ridley mortality? Heppell's previous demographic models applied a post-1989 mortality-reducting multiplier to total mortality (both natural and anthropogenic combined) as one means of accounting for beneficial effects of turtle excluder devices (TEDs). However, TEDs do not reduce natural mortality. Gallaway et al. (2013), Gallaway and Caillouet (2014), and Gallaway and Gazey (2014) incorporated a Kemp's ridley mortality reducing multiplier, applied (beginning in 1990) as a TED effect that reduced annual instantaneous mortality of Kemp's ridleys (not natural mortality), under a working hypothesis that all annual anthropogenic mortality was due to shrimping, except in 2010. In this way, a maximum impact of annual shrimping related mortality on the Kemp's ridley ridley population was estimated. These new and unique Kemp's ridley stock assessment models should be discussed and cited in the text, and their citations included in the References section, as well as discussed, in this 5-yr review. These new models represent the best available demographic modeling science employed to date, in my opinion.

Sentence: Since the last 5-year review (NMFS and FWS 2007), we continue to make strides in our knowledge of the biology of Kemp's ridleys, especially away from the nesting beach.

Comment: Because of the catastrophic oil spill in the northern Gulf of Mexico in 2010, and major drops in annual Kemp's ridley nests in Tamaulipas in 2010, 2013, and 2014, major strides and advances have recently been made in Kemp's ridley stock assessment modeling (see previous comment above). Results of such modeling suggest that recovery efforts should be focused on restoring Kemp's ridley population growth by increasing annual numbers of hatchlings released. Population growth and hatchlilng releaqses were both increasing exponentially prior to 2010 (Caillouet 2014). Successful conservation efforts in Tamaulipas helped set the Kemp's ridley population on its exponential trajectory toward recovery through 2009, and they also put annual hatchling releases from Tamaulipas beaches on an exponential trajectory of increase. This resulted in time-lagged, increasing proportions of young adult female Kemp's ridleys added to the population, one consequence of which appears to be an overall reduction in the annual number of hatchlings released per nest in Tamaulipas (Caillouet 2014). As a result, it will now take about twice as many nests to produce a given number of hatchlings as it did in 1989, when hatchlings per nest was at its peak (ibid.). Coupled with the 2010, 2013 and 2014 drops in nests in Tamaulipas, this apparent decline in overall fecundity of nesters provides additional challenges to restoration of population growth. To make matters worse, around 2010 USFWS began cutting its funding for conservation efforts in Tamaulipas. Lack of funding was itentified in NMFS et al. (2011) as a threat to recovery. In 2009, the situation appeared rosy for Kemp's ridley recovery (http://www.fws.gov/endangered/news/bulletin-summer2009/brighter-future-for-kemp.html; NMFS et al. 2011), and this may have been USFWS' rationale for cutting its funding. However, this rosy outlook changed abruptly in 2010 (Caillouet 2010, 2011, 2014; Crowder and Heppell 2011; Heppell 2014, in press). All of this evidence, which is the best scientific evidence available, suggests that more attention should be focused on nesting beaches than away from them. Kemp's ridley is at a new crossroads, and the seriousness of its current situation and status should be made clear in this 5-yr review. Concern for Kemp's ridley is also evidenced by the fact that the IUCN Marine Turtle Specialist Group is conducting a new Red List Assessment of Kemp's ridley in 2015, led by Dr. Thane Wibbels with assistance of Dr. Elizabeth Bevan. See, cite, and discuss the following relevant papers, and add them to the References in this 5-yr review: Caillouet, C.W., Jr. 2010. Editorial: Demographic Modeling & Threats Analysis in the Draft 2nd Revision of the Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (*Lepidochelys kempii*). http://www.seaturtle.org/mtn/PDF/MTN128.pdf This paper mentions the Deepwater Horizon oil spill and its potential impacts. Caillouet, C.W., Jr. 2011. Guest Editorial: Did the BP-Deepwater Horizon-Macondo Oil Spill Change the

Age Structure of the Kemp's Ridley Population? http://www.seaturtle.org/mtn/PDF/MTN130.pdf This paper predicts alteration of the Kemp's ridley population's age structure (i.e., through age-specific mortality), and the potential for it to leave a demographic mark on the population for years to come. Caillouet, C.W., Jr. 2012. Editorial: Does delayed mortality occur in sea turtles that aspirate seawater into their lungs during forced submergence or cold stunning? http://www.seaturtle.org/mtn/PDF/MTN135.pdf This paper is relevant to continued annual strandings of Kemp's ridleys, and other sea turtle species, despite the use of TEDs. Gallaway, B.., and C.W. Caillouet, Jr. 2014. The 2013 Kemp's Ridley Stock Assessment: Shrimp Trawls and Oil Spills. p. 10 (Abstract) In: Plotkin, P., and L.J. Peña (Co-organizers). Second International Kemps Ridley Sea Turtle Symposium, Brownsville, Texas, 60 pp. http://texasseagrant.org/assets/uploads/resources/14-101_SIKRSTS_program.pdf Gallaway, B., and W.J. Gazey. 2014. The 2014 Kemp's Ridley Stock Assessment: Reduced Nesting or Reduced Nesters? p. 11 (Abstract) In: Plotkin, P., and L.J. Peña (Co-organizers). Second International Kemps Ridley Sea Turtle Symposium, Brownsville, Texas, 60 pp. http://texasseagrant.org/assets/uploads/resources/14-101_SIKRSTS_program.pdf Heppell, S. 2014. The Fragility of Recovery: Implications of the Dramatic Reduction of the Kemp's Ridley Population Growth Rate Since 2010. p. 9 (Abstract) In: Plotkin, P., and L.J. Peña (Co-organizers). Second International Kemps Ridley Sea Turtle Symposium, Brownsville, Texas, 60 pp. http://texasseagrant.org/assets/uploads/resources/14-101_SIKRSTS_program.pdf Nance, J.M., C.W. Caillouet, Jr., and R.A. Hart. 2010. Size-composition of annual landings landings in the white shrimp, *Litopenaeus setiferus*, fishery of the northern Gulf of Mexico, 1960-2006: its trends and relationships with other fishery-dependent variables. Marine Fisheries Review 72(2):1-13. http://spo.nmfs.noaa.gov/mfr722/mfr7221.pdf This paper shows the decline in white shrimp-targeted shrimping effort. Plotkin, P., and L.J. Peña (Co-organizers). 2014. Second International Kemps Ridley Sea Turtle Symposium, Brownsville, Texas, 60 pp. http://texasseagrant.org/assets/uploads/resources/14-101_SIKRSTS_program.pdf

Section 2.3.1

Reference Figure 1

Comment: This figure does not show proportions of total nests. Its colored circles depict class intervals of **"**numbers of nesting events" (see the legend box) in geometric scale. However, "nesting events" have not been defined, but should be. Typically, annual numbers of nests have been used to show differences in nesting intensities among nesting beaches. This figure needs modifications for clarity and accuracy.

Sentence: Post-nesting migration of females from Rancho Nuevo and Texas beaches indicate that turtles move along coastal migratory corridors either to the north or south from the nesting beach (Byles 1989b; Byles and Plotkin 1994; Hughes and Landry 2013; Renaud 1995; Renaud *et al*. 1996; Seney and Landry 2011; Shaver 1999, 2002; Shaver and Rubio 2008; Shaver *et al.* 2013).

Comment: Discuss and cite Shaver and Caillouet *(in press*, Herp. Conserv. & Biol.): Shaver, D.J., and C.W. Caillouet, Jr. *in press*. Reintroduction of Kemp's ridley (*Lepidochelys kempii*) sea turtle to Padre Island National Seashore, Texas, and its connection to head-starting. Herpetological Conservation and Biology.

Sentence: Mating is believed to occur about 3 to 4 weeks prior to the first nesting (Rostal 2007), which means it occurs during late March through early to mid-April. It is presumed that most mating takes place near the nesting beach (Morreale *et al*. 2007; Rostal 2007).

> *Comment*: Does this mean the female's first nesting ever, or the female's first nesting in a particular nesting season?

Sentence: After successfully mating prior to the nesting season, the female is capable of storing the sperm in the upper oviduct, and will then use that sperm to fertilize eggs after each ovulation during the nesting season (Rostal 2007).

> *Comment*: Mating may also occur during the nesting season. In the Andres Herrera (1947) movie, a male Kemp's ridley is shown chasing a female up the beach at Rancho Nuevo during that huge arribada.

Sentence: The Shaver *et al*. (2005) study focused on capturing males in the waters near Rancho Nuevo and may represent a bias since resident males may have been more available for capture than transient males.

> *Comment*: So, how would this 5-yr review suggest sampling of "transient males" to avoid this putative bias?

Sentence: Hatchling dispersal is not well known, but is likely influenced by the oceanic currents in the western Gulf of Mexico (NMFS *et al.* 2011; Putman *et al.* 2013).

> *Comment*: Cite and discuss the following additional papers (include in the References, those not already included): Putman et al. (2010), which is in the References section.. Direct Evidence of Swimming Demonstrates Active Dispersal in the Sea Turtle ''Lost Years''By Nathan F. Putman, and Katherine L. Mansfield: http://dx.doi.org/10.1016/j.cub.2015.03.014, Putman and Lohmann. 2008. Compatibility of magnetic imprinting and secular variation. Current Biology 18(14): R596

Sentence: Kemp's ridley hatchlings enter the Gulf of Mexico from beaches near Rancho Nuevo, Mexico, and are presumably carried by major oceanic currents (e.g., anticyclonic Mexican Current) into various areas of the Gulf of Mexico and North Atlantic (Collard and Ogren 1990).

> *Comment*: There are other currents and gyres involved, according to the papers cited in the previous comment. A lot more information has become available since Collard and Ogren (1990) was published. Also discuss and cite Witherington et al. (2012a) here.

Sentence: This period is within four days of hatching, which is thought to be extent of the hatchling's reserve energy stores from the nutrient rich yolk sac (Kraemer and Bennett 1981).

> *Comment:* Cite, discuss, and include in References, the following paper:Fontaine, C.T., T.D. Williams. 1997. Delayed feeding in neonatal Kemp's ridley, *Lepidochelys kempii*: A captive sea turtle management technique. Chelonia Conserv. Biol. 2:573-576

Sentence: Juveniles spend approximately 2 years in the ocean prior to recruiting to nearshore waters (Epperly *et al.* 2013; Ogren 1989; Snover *et al.* 2007; Zug *et al*. 1997).

> *Comment*: Cite Witherington et al. (2012a) here. The following paper is also relevant to this discussion, even though it involved head-started Kemp's ridleys: Caillouet, C.W., Jr., C.T. Fontaine, T.D. Williams, and S.A. Manzella-Tirpak. 1997. Early growth in weight of Kemp's ridley sea turtles (*Lepidochelys kempii*) in captivity. Gulf Research Reports 9(4):239-246. http://www.seaturtle.org/pdf/ocr/CaillouetJrCW_1997_GulfResRep.pdf

Sentence: Along the U.S. Atlantic coast, neritic juveniles make seasonal north and south migrations (NMFS *et al.* 2011). The offshore waters south of Cape Canaveral have been identified as an important overwintering area for seasonal migrants along the U.S. Atlantic coast (Henwood and Ogren 1987; Schmid 1995).

> *Comment*: See comment above regarding the contribution that Kemp's ridleys in the Atlantic ocean make to the population in the Gulf of Mexico.

Sentence: Growth rates vary by geography and ontogeny.

> *Comment:* Cite Marquez M. (2001), because it points out that there is a great deal of variability among individual Kemp's ridley in their size and age at maturity:

Sentence: Generally, growth rates in the Gulf of Mexico are greater (~7.0 cm/yr; Landry *et al.* 2005; Fontaine *et al.* 1989; Schmid and Woodhead 2000) than in the Atlantic Ocean (~ <6.0 cm/yr; Morreale and Standora 1998; Schmid and Woodhead 2000).

> *Comment*: Cite Caillouet et al. (1995) here: Caillouet, C., C.T. Fontaine, S.A. Manzella-Tirpak, and T.D. Williams. 1995. Growth of head-started Kemp's ridley sea turtles (*Lepidochelys kempi*) following release. Chelonian Conservation and Biology 1:231-234. It's in the References Note: Fontaine et al. (1989) also involves head started Kemp's ridleys. Also cite and discuss Caillouet et al. (2011), which is in the References, and is also relevant to Kemp's ridley age and growth analyses. It presents a novel approach to fitting a von Bertalanffy curve to known-aged Kemp's ridleys, excluding the exponential phase of juvenile growth, and including known mature females. It is also based on mark-recapture data.

Sentence: Based on known size-at-age head-started Kemp's ridleys, Snover *et al*. (2008) estimated that juveniles transition to subadult stage at about 4.3 years of age and at 52.2 cm SCL.

> *Comment*: Also cite Caillouet et al. (2011) here, because it discusses age, growth, and age at first nesting (i.e., first reproduction, and maturity). It is cited in the References.

Sentence: Several studies, including those of captive turtles, recaptured turtles of known age, mark-recapture data, and skeletochronology, have estimated the overall average age at maturity in Kemp's ridleys ranges between 5 and 7 years (Marquez 1972), 5 to 12 years (captive only, Bjorndal *et al.* 2014), 10 and 16 years (Chaloupka and Zug 1997, Schmid and Witzell 1997, Zug *et al.*1997, Schmid and Woodhead, 2000), and 9.9 to 16.7 years (Snover *et al.* 2007).

> *Comment*: The following discussion, on p. 19 of Marquez M. (1994; already cited in the References), is relevant to this discussion of the relationship between size and age at maturity in Kemp's ridley:"…. in the wild, size is not that important in determining sexual maturity, since nesting females can be observed at the Rancho Nuevo Beach which are only 55 cm carapace length (SCL), similar to those in captivity. In addition, it

is logical to surmise that the age at maturity can vary considerably, caused by external and internal factors. These factors will cause some generations to reach sexual maturity early and in retarded others, and that there may be variations in the same cohort due to genetic characteristics (internal factors). This indicates that the arrival of reproductive turtles are composed of a combination of different year groups, and that the average size of the nesting turtles at any given time (Table 5) may show pronounced variations. Therefore, the age and size at initial maturity are so variable that they should be checked annually in order to conduct meaningful population analysis."

Sentence: Females lay an average of 2.5 clutches (range 1.8 – 3.075) within a season (TEWG 1998; TEWG 2000), which is the value used in the Bi-National Kemp's Ridley Recovery Plan (NMFS *et al.* 2011).

Comment: Cite, discuss, and add Witzell et al. (2005) and Witzell et al. (2007) to this discussion and References: http://www.sefsc.noaa.gov/turtles/PR_Witzell_et_al_2005_CCB.pdf, W. N. WITZELL, P. M. BURCHFIELD, L. J. PEÑA, R. MARQUEZ-M., and G. RUIZ-M. 2007. Nesting Success of Kemp's Ridley Sea Turtles, *Lepidochelys kempi*, at Rancho Nuevo, Tamaulipas, Mexico, 1982–2004. Marine Fisheries Review 69(1-4):46-52. http://spo.nmfs.noaa.gov/mfr691-4/mfr691-43.pdf

Sentence: In addition, Frey *et al.* (2014) were unable to assign 19 of 141 nests, which suggest the existence of undetected nesting females.

Comment: Cite and discusss Pritchard (1990), who also found that some nests (i.e., nesting females) go undetected: PRITCHARD, P.C.H. 1990. Kemp's ridleys are rarer than we thought. Marine Turtle Newsletter 49:1-3. http://www.seaturtle.org/mtn/archives/mtn49/mtn49p1.shtml

Sentence: Average number of eggs per clutch range from 95 to112 with 42-62 days of incubation prior to hatching (Burchfield 2009; Guzmán-Hernández 2007).

Comment: Average number of hatchlings per nest (i.e., per clutch) reflects average number of eggs per clutch, and average number of hatchlings per clutch peaked in 1989, and had declined roughly linearly ever since (Caillouet 2014). This probably reflects a trend of overall decline in fecundity of nesters, the consequence of increasing proportions of neophyte nesters being added each year through 2009, which is a result of exponentially increasing annual hatchling releases in Tamaulipas through 2009 (ibid.). Of course, other factors besides decline in fecundity could reduce average number of eggs per nest, and therefore number of hatchlings per nest. Also, it is not expected that, all of a sudden, nesters have become less fecund and have larger remigration intervals than in earlier years.

Sentence: Kemp's ridleys tend to nest in large aggregations or arribadas (Bernardo and Plotkin 2007). Nesting in large aggregations may be advantageous for a variety of reasons, including mate finding and enhancing the survival of eggs and hatchlings due to predator swamping (Bernardo and Plotkin 2007).

Comment: And multiple mating, resulting in multiple paternity, which maintains genetic diversity.

Sentence: Some Kemp's ridleys will nest between arribadas as solitary nesters and thus exhibit a shorter internesting interval (e.g., 14 days) than the arribada nesters (Rostal *et al*. 1997; Rostal 2007).

> *Comment*: Is the observation of night time nesting of any interest or significance with regard to changing reproductive parameters? It has been observed and documented in a series of Gladys Porter Zoo annual reports on the work in Tamaulipas.

Sentence: Sex determination is temperature dependent and occurs during the middle third of incubation, which is known as the thermosensitive period (reviewed by Wibbels 2003, 2007).

> *Comment*: Cite and discuss Mrosovsky and Godfrey (2010), who provided their thoughts on climate change and sex ration: N. Mrosovsky & Matthew H. Godfrey. 2010. Editorial: Thoughts on Climate Change and Sex Ratio of Sea Turtles. Marine Turtle Newsletter 128:7-11. http://www.seaturtle.org/mtn/archives/mtn128/mtn128p7.shtml Also cite and discuss the response by Caillouet (2012): Charles W. Caillouet, Jr. 2012. Editorial: Do Male-Producing Kemp's Ridley Nesting Beaches Exist North of Tamaulipas, Mexico? *Marine Turtle Newsletter* 134:1-2.
> http://www.seaturtle.org/mtn/archives/mtn134/mtn134p1.shtml

Sentence: The reasons for the variation are unknown, but could relate to many factors including biased sampling (e.g., sampled in a migration corridor used more frequently by one sex or sampled from stranded turtles, which may represent differential mortality) (reviewed by Wibbels 2007).

> *Comment:* Is it possible that female-biased sex ratios are a consequence of the highly manipulative conservations efforts employed in Tamaulipas, in which most clutches have been moved to protected corrals, on relative high elevations of the beaches in Tamaulipas? There can be no doubt that female-biased sex ratios of hatchlings released have had a positive effect on the exponential trend toward population recovery through 2009, since only females nest and lay eggs! The more female hatchlings released, the more nesters can be expected in later years, especially since males can inseminate multiple females. Is there any evidence at all that the number of males has been limiting in any way? Has maximum fertilization rates proven to be necessary for Kemp's ridley population recovery? If they were, it seems that maximizing fertilization rates, by increasing the proportions of male hatchlings released would have been designated a recovery priority in the various recovery plans.

Sentence: Due to intensive conservation actions, the Kemp's ridley began to slowly rebound during the 1990s.

> *Comment*: The Kemp's ridley population's slow rebounding began in the mid-1980s! The decline in annual nests ended in 1986, before any TEDs were used experimentally or mandated by TED regulations, so it was all attributable to conservation efforts in Tamaulipas, during a time when shrimping effort levels were increasing. TEDs could not have had any influence at all on reversal of the decline in annual nest numbers. Shrimping effort by the U.S. fleet peaked around 1989 then began to decline (Caillouet et al. 2008; Nance et al. 2010); see also the recent stock assessments for brown shrimp, white shrimp, and pink shrimp in the Gulf of Mexico:

http://docs.lib.noaa.gov/noaa_documents/NMFS/SEFSC/TM_NMFS_SEFSC/NMFS_SEFSC_TM_638.pdf

http://184.106.97.89/sites/default/files/stock_assessment_of_white_shrimp_litopenaeus_setiferus_in_the_u.s._gulf_of_mexico.pdf
http://docs.lib.noaa.gov/noaa_documents/NMFS/SEFSC/TM_NMFS_SEFSC/NMFS_SEFSC_TM_637.pdf Cite and discuss the following paper: Caillouet, C.W., Jr. 2003. Improved Assessments and Management of Shrimp Stocks Could Benefit Sea Turtle Populations, Shrimp Stocks and Shrimp Fisheries. *Marine Turtle Newsletter* 100:22-27. http://www.seaturtle.org/mtn/archives/mtn100/mtn100p22.shtml As a consequence of the decline in shrimping effort, shrimp CPUE increased rapidly to high levels, but at the same time economic conditions deteriorated within the domestic shrimp fishery, for many reasons (see Caillouet et al. 2008; Nance et al. 2010). The decline in shrimping effort, coupled with TED regulations and use, helped set the Kemp's ridley population on an exponential course toward recovery through 2009 (Caillouet 2010, 2011, 2014).

Sentence: The number of nests at Rancho Nuevo increased to 1,430 in 1995, 6,947 in 2005, and 15,459 in 2009 (J. Pena, Gladys Porter Zoo (GPZ), personal communication 2012). However, in 2010 the number of nests dropped to 9,940, a 37% reduction from 2009. In 2011 and 2012, the number of nests at Rancho Nuevo exceeded 16,000 nests each year (J. Pena, GPZ, personal communication 2013). A similar pattern of exponential increase through 2009 and a drop in 2010 was recorded at Playa Dos, Tepehuajes, and other adjacent beaches in Mexico.

Comment: Here, the use of numbers of nests just for Rancho Nuevo really confuse the situation with regard to status of the Kemp's ridley population. The standard for demographic modeling has been to model the trend in nests on the three index beaches, starting with Rancho Nuevo only during 1966-1987, then adding the other two beaches thereafter. The details of beaches covered by monitoring nests, eggs, and hatchlings over years really should be given in this 5-yr review, for clarity and consistency. It would be useful and enlightening if a table of annual numbers of nests, eggs, and hatchlings were included in this 5-yr review, as the best available data set, 1966-2014. Does Figure 1 include just data for the three index beaches, or for all Tamaulipas beaches conbined? If the latter, this is a big and continuing problem for readers who may be unfamiliar with such details. However, since Heppell's updated model is so important to this 5-yr review, such details about which Tamaulipas beaches the numbers represent are critical to an understanding of actual trends in the Kemp's ridley population (indexed by nests on Rancho Nuevo, Tepehuajes, and Barra del Tordo-Playa Dos beach segments combined, not to mention trends in eggs and hatchlings. For Texas, there is no problem. Total annual nests for all combined nesting sites in Texas are plotted, and no demographic modeling has been applied to these nest numbers, as far as I am aware.

Reference Figure 2

Comment: Shouldn't this be "Prior to 1988"? Mentioning this is good, but also mention the added beaches surveyed after 1987. See explanation from the 2013 annual report for the bi-national program, published by Gladys Porter Zoo : "From 1966 to 1987, conservation efforts focused on the area of Rancho Nuevo with the camp located first at Barra Calabazas and then at Barra Coma where it presently exists. In 1978, the U.S. joined with Mexico at Rancho Nuevo. In 1988, the program, now a bi-national one, expanded to the south to Barra Del Tordo with a camp at Playa Dos. In 1989 a third camp was established to the north at Barra Ostionales on Rancho Los Pericos. The north camp's location was changed 10 kilometers to the north of its original location, to near the town of Tepehuajes in 1996 for logistical reasons."

Sentence: Given the recent lower nest numbers, the population is not projected to grow at former rates (e.g., 15% per year from 1988-2003; Heppell *et al.* 2005).

Comment: If the Heppell model was updated for the recovery plan (NMFS et al. 2011) and for this 5-yr review, why isn't it cited instead of Heppell et al. 2005, which used annual nest numbers only through 2003? What was the last year of data on nests in the update model used in NMFS et al. (2011). Such details are essential to an understanding of applicability of demographic models to the current Kemp's ridley situation.

Sentence: The updated model could only attain a best fit to the observed nests since 2009 by applying an unreasonable decrease in annual survival rates of immature and adult turtles, resulting in a population decline of over 40% per year.

Comment: What is the basis for calling the decrease in survival rates unreasonable? What else could account t for such extraordinary and abrupt drops in nest numbers in 2010? Caillouet (2014) suggests one hypothesis, and this should be discussed along with other published hypotheses that have attempted to explain why post-2009 nest numbers did not continue to increase as predicted by NMFS et al. (2011)! That is, at a rate of 19% per year from 2010 through 2020. The differences between predicted and observed annual nests are important here, for each year 2010-2014. The departures of observed nests from predicted nests indicate a huge impact on the population. Although there were pre-2010 signs that density dependence may have started to reduce the rate of growth in the population, they probably would not have resulted in a large and abrupt departure of observed nests in 2010 as compared to predicted nests. Does NMFS believe that post-2009 nests numbers represent the population's maximum (i.e., asymptote)? If so, this would suggest that the downlisting and delisting criteria are flawed. These criteria apparently are based on the estimated size of the 1947 arribada. Estimates of this arribada's size were revisited by Dickerson and Dickerson (2006; included in the References, but not in the text of this 5-yr review). However, the Dickerson and Diskerson (2006) re-estimate of the 1947 arribada were lower by an order of magnitude compared to previous estimates, and dismissed in a footnote in NMFS et al. (2011). A number of hypotheses have been published in attempts to explain failure of observed post-2009 nest numbers to meet expectations (i.e., predictions), and all should be cited and discussed in this 5-yr review. To state that results indicate the population is not recovering and cannot meet recovery goals is a gross understatement. It seems to be declining! Therefore, it is extremely important that NMFS and USFWS determine the cause or causes of the observed dramatic changes that have taken place in the trajectory of annual nests numbers at the three index beaches in Tamaulipas since 2009.

Sentence: Short-term removals of immature or mature turtles from the model gave poor model fits, suggesting that there is a persistent reduction in survival and/or recruitment to the nesting population.

Comment: Huge departures of the observed from predicted post-2009 annual nests numbers for the three index beaches in Tamaulipas may not be able to be modeled using currently available models. The exponential trajectory through 2009 has been well established, but something major happened in 2010 that caused the unprecedented drop in nests, and it seems to have had a lasting, detrimental effect on the Kemp's ridley population. Only adult females nest and lay clutches, so the focus of investigation logically should be on what happened after the 2009 nesting season to reduce nesting in the 2010-2014 nesting seasons, as compared to NMFS et al. (2011) predictions. Caillouet (2014) suggests that it was a fundamental, detrimental alteration of the 2009 age structure and momentum of the population that occurred some time between the ends of the 2009 and 2010 nesting seasons, and which had a carryover impact on annual nest numbers in 2011-2014. Caillouet (2014) suggested that it was unprecedented mortality in subadult and adult females.

Sentence: However, caution is warranted on interpreting the results, given the model is fitted to nest counts only and does not account for impacts to the youngest age classes and variability or changes in demographic parameters, such as proportion of adults nesting (Heppell, S., OSU, unpublished data 2015).

Comment: Youngest age classes could not have had an impact on nest numbers, because of the time-lag required for maturation. An unprecedented, abrupt reduction in the proportion of adults nesting (through mortality) certainly could explain the post-2009 changes in numbers of nests, which is what Caillouet (2014) hypothesized. However, the cause or causes of such high level mortality have not been determined.

Sentence: Likewise, changes in somatic growth rates and age at maturation could affect expected recruitment to the adult nesting population. Nest counts and hatchling production are key indicators of population status for this species but are insufficient to diagnose the cause of changes in nest numbers and the apparent population trajectory.

Comment: Is it the function of a 5-year review to recommend future research? All of these suggested research areas are important, but not likely to explain the observed, abrupt change in 2010 and its aftermath, as compared to pre-2010 predictions by NMFS et al. (2011).

<u>Section 2.3.2.1</u>

Sentence: However, as the population of Kemp's ridleys has increased over the past decade, an increasing number of turtles are nesting in areas north and south of Rancho Nuevo (Burchfield 2009).

Comment: The population (indexed by nests at Rancho Nuevo) began increasing in 1986, almost three decades ago! Nesting north and south of Rancho Nuevo apparently began after 1986. See comments above, regarding the three population index beaches.

Sentence: Currently, Texas A&M University-Galveston monitors nesting and protects nests at Bolivar Island and Galveston Island, Brazoria National Wildlife Refuge (NWR) from Surfside to Matagorda Peninsula, Aransas NWR on Matagorda Island, University of Texas Science Center on San Jose and Mustang Islands, PAIS along North Padre Island, Laguna Atascosa NWR along South Padre Island, and Lower Rio Grande Valley NWR at Boca Chica.

Comment: An explanation should be added concerning translocation of clutches from some of these locations to PAIS for incubation, hatching, and releases at PAIS. For example, it is my understanding that all clutches found on the Upper Texas Coast are translocated to PAIS. Clutches from some of the other areas listed may also be translocated to PAIS. This should be explained, especially in the context of survival rates of clutches left *in situ*, and clutches found on what may be male-producing beaches (see Mrosovsky and Godfrey 2010; Caillouet 2012 http://www.seaturtle.org/mtn/archives/mtn134/mtn134p1.shtml).

Sentence: Because the Kemp's ridley has one primary nesting beach, this species is particularly susceptible to habitat destruction by natural and human caused events.

Comment: This is correct, and it is Rancho Nuevo. The other two major nesting beaches are Tepehuajes and Barra del Tordo-Playa Dos, which should be designated either secondary or tertiary.

Sentence: The long-term impacts to sea turtles as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known (Crowder and Heppell 2011; NMFS 2012).

Comment: Causes of the short-term or immediate impacts have not been determined with certainty concerning Kemp's ridley. Strandings of oiled and non-oiled Kemp's ridleys in 2010 cannot account for the magnitudes of departures of observed from predicted nest numbers in 2010-2014!

Sentence: Declines in the number of nests reported in 2010 at Tamaulipas, Mexcio, may be attributed to the DWH oil spill, however other plausible explanations for the decline exist (e.g. environmental variants, alternate-year nesting oscillation) (Caillouet 2011), or density-dependent factors (e.g., habitat carrying capacity) may be limiting population growth (Caillouet 2014; Gallaway *et al.* (2013).

Comment: The main focus of Caillouet (2011) with regard to the oil spill was:"Therefore, for the oil spill to have reduced nesting in 2010, it would have had to kill large numbers of nesters directly or indirectly (e.g., by killing or tainting their prey), provide barriers preventing them from reaching nesting beaches in the western Gulf, or otherwise interfere with their ability to navigate to nesting beaches (see Putman *et al*. 2010)." This focus must be made clear in the 5-yr review. Caillouet (2011) did offer alternative explanations: "Alternatively, the decline in 2010 could represent a natural, alternate- year nesting oscillation, unrelated to the oil spill, or differences in environmental variables (e.g., temperature) during the nesting seasons of 2009 and 2010." However, this was not the main focus, and clarification is required. Emphasizing his main focus, Caillouet went on to state:"The oil spill could have had differential impacts on various life stages of Kemp's ridley, thereby altering the population's age structure and creating a potentially long-lasting and recognizable demographic mark. It might be recognizable in 2011 and in years to come. For example, the drop in hatchlings released in 2010 could make the 2010 cohort recognizable over many years. If this cohort can be followed over the years (e.g. by modeling its location in annual age structure), it could provide useful data for estimating age as sexual maturity, and perhaps other population vital statistics." Caillouet (2011) went further to state that: "Any life stage-specific impacts of the oil spill likely would have been influenced by temporal-spatial distributions of the life stages in relation to temporal-spatial distribution of oil and dispersants (Collard & Ogren 1990; Putman *et al*. 2010). A “before spill-after spill” comparison of size distributions, or age distributions derived by transforming size to age using somatic growth curves, might reveal life stage-specific impacts if they occurred. There are many potential sources of information on sizes of Kemp’s ridleys in the population, including the Sea Turtle Stranding and Salvage Network (STSSN), conservation programs on nesting beaches, in-water studies, and by-catch investigations.” “If age structure of the population was significantly altered by the oil spill or dispersants, Kemp’s ridley recovery could be delayed (Crowder and Heppell 2011), by reducing population momentum and altering reproductive value of the population (Heppell *et al*. 2007; Caillouet 2010).”This must be clarified in the 5-yr review. Caillouet (2014) offered one hypothesis to explain the drop in numbers of nests on the three index beaches in Tamaulipas 2010, and it was not “density-dependent factors … limiting population growth.” It had to do with mortality affecting age structure and population momentum. This must be clarified in the 5-yr review. “Natural and anthropogenic mortalities were expected to occur in all Kemp’s ridley life stages following the nesting season in 2009 (Crowder & Heppell 2011; NMFS *et al*. 2011; Gallaway *et al*. 2013; Heppell In press), but the only life stages that could have affected the 2010 nest count were adult females, and subadult females that matured between the ends of nesting seasons in 2009 and 2010. However, natural and anthropogenic mortalities in adult and subadult females were not expected to reach levels high enough to interrupt exponential growth in annual nests (Crowder & Heppell 2011; NMFS *et al*. 2011; Gallaway *et al*. 2013; Heppell In press). After the 2010 drop in nests, the substantial increase in nests in 2011 and the slight increase in nests in 2012 (Fig. 1; see also Burchfield & Peña 2013) were encouraging, but probably resulted from population momentum. They suggested that population growth had quickly resumed (Gallaway *et al*. 2013), and provided hope that exponential growth would soon resume. However, the numbers of nests in 2011-2013 were well below those predicted (Fig. 1).” Caillouet (2014) explained further: “I hypothesize that the 2009 age distribution and momentum of the Kemp’s ridley population in the Gulf of Mexico were fundamentally altered by substantial reductions in numbers of turtles of both sexes at all ages, following the end of the 2009 nesting season (Caillouet 2011)." "Fundamental alteration of the 2009 age distribution and momentum of the female portion of the Kemp’s ridley population represents (hypothetically) a much greater population setback than previously reported (e.g., Crowder & Heppell 2011; Gallaway *et al*. 2013). If my hypothesis is true, conservation efforts going forward may not be sufficient to prevent further decline for a decade or more, because of the time-lag between release of new cohorts of hatchlings and maturation of surviving females from these cohorts. However, without such efforts the decline could be protracted further." "The post-2009 departure of observed annual numbers of nests from those predicted (Fig. 1) obviously reflected a reduction in nesting by females that were already adults and those that became adults after the 2009 nesting season. Clearly, if numbers of adult and subadult females were substantially reduced by higher than expected mortality, this could explain reduced numbers of nests in 2010 and subsequent years as compared to model-predicted numbers of nests. However, nesting also could have been reduced by non-lethal factors that prevented migration to nesting beaches, egg production, or both (Benny Gallaway, personal comm., August 2014)."This must be clarified in the 5-yr review.

Sentence: Global warming is an anthropogenic factor that will affect Kemp's ridley habitat and biology.

Comment: Add relevant discussions from Mrosovsky and Godfrey (2010) and Caillouet (2012) regarding male-producing nesting beaches in the context of global warming

Sentence: For these reasons, the Services believe the Kemp's ridley sea turtle remains in danger of extinction because of ongoing and threatened destruction, modification, and curtailment of their habitat.

Comment: Add something about its currently declining population!

Section 2.3.2.2

Sentence: Extensive protection measures along all of the main nesting beaches in Mexico have eliminated this threat, although if these protection measures were removed it is likely at this point in time that exploitation of eggs would resume without development of a more extensive community based conservation program.

Comments: Cite Caillouet et al. (in press), which includes a discussion of the Kemp's Ridley Restoration and Enhancement Program, and the manipulative conservation measures employed in Mexico, which are credited with restoring and enhancing annual hatchling production. What is the likelihood of development of a community based conservation program sufficient to replace almost five decades of governmental conservation efforts that eliminated the threat of human exploitation of eggs in Tamaulipas and helped set the Kemp's ridley population on an exponential course toward recovery? Is there an expectation that "these protection measures" will be removed, perhaps portended by USFWS' multi-year cuts to funding for conservation work in Tamaulipas?

Sentence: For the reasons described above, the Services believe that currently the Kemp's ridley is not in danger of extinction due to overutilization for commercial, recreational, scientific, or educational purposes.

Comment: Two Biological Opinions (issued in May 2012 and April 2014) of Section 7 Consultations by NOAA NMFS (<http://sero.nmfs.noaa.gov/protected_resources/sea_turtles/documents/shrimp_biological_opinion_2014.pdf>) concluded that continued implementation of sea turtle conservation regulations under the ESA and continued authorization of the Southeast U.S. shrimp fisheries in federal waters under the MSFCMA were not expected to cause an appreciable reduction in likelihood of survival and recovery of Kemp's ridleys in the wild. This should be mentioned in the 5-yr status review, and Magnuson et al. (1990) cited in its text and References, since shrimp trawling has been designated the most important source of anthropogenic mortality in sea turtles: Magnuson, J.J., K.A. Bjorndal, W.D. Dupaul, G.L. Graham, D.W. Owens, C.H. Peterson, P.C.H. Pritchard, J.I. Richardson, G.E. Saul & C.W. West. 1990. Decline of the sea turtles: causes and prevention. National Research Council Committee on Sea Turtle Conservation, National Academy Press, Washington, DC. 259 pp.

Section 2.3.2.3

Sentence: If the number of nests begins to increase again, a greater number of nests will be left in their natural locations on the beach. Predator abundance may increase to take advantage of available food, but the arribada phenomenon helps to enhance hatchling survival through predator swamping.

> *Comment:* How soon do NMFS and USFWS expect numbers of nests to begin increasing again? It does not seem realistic, under circumstances of the current decline in nest numbers, to leave any nests *in situ*, regardless whether predation is expected to remain low, and hatchling survival high. Nest density probably has decreased since 2009!

Sentence: Once in the water, it is presumed that Kemp's ridley experience predation similar to other sea turtles, with hatchlings being preyed upon by a variety of predatory fish.

> *Comment:* Are there any indications of mutilation of Kemp's ridleys by humans; e.g., provided by strandings data?

Sentence: Brevetoxin concentrations were significantly higher (by 59%, P = 0.04) for wild-caught Kemp's ridleys exposed to red tides compared to turtles sampled between red tide events (Perrault *et al.* 2014).

> *Comment:* How much mortality was caused by such exposure?

Section 2.3.2.4

Sentence: The conservation and recovery of sea turtles is enhanced by a number of regulatory instruments at international, regional, national, and local levels. Considering the broad North Atlantic Ocean distribution of Kemp's ridleys, legal instruments that target or impact sea turtles in the Atlantic Ocean are almost certain to cover Kemp's ridleys.

> *Comments:* Does IUCN have any status or influence with regard to regulated protection of Kemp's ridleys? The bulk of the Kemp's ridley population appears to remain in the Gulf of Mexico, and there is little evidence that Kemp's ridleys in the Atlantic return in numbers sufficient to influence the population in the Gulf of Mexico. The focus should be on the Kemp's ridley population in the Gulf of Mexico, rather than the focus implied here.Revise and clarify accordingly.

Sentence: Currently, all five of the tuna RFMOs call on their members and cooperating non-members to adhere to the 2009 FAO "Guidelines to Reduce Sea Turtle Mortality in Fishing Operations," which describes all the gears sea turtles could interact with and the latest mitigation options. Fisheries deploying purse seines, to the extent practicable, must avoid encircling sea turtles and release entangled turtles from fish aggregating devices. Longline fishermen must carry line cutters and use dehookers to release sea turtles caught on a line. Longliners must either use large circle hooks, whole finfish bait, or mitigation measures approved by the Scientific Committee and the Technical and Compliance Committee.

> *Comment*: Is there evidence that Kemp's ridleys are bycaught in such fisheries. If so, sources of information on this bycatch should be cited in this 5-yr review.

Sentence: This Convention, also known as the Bonn Convention or CMS, is an international treaty that focuses on the conservation of migratory species and their habitats. As of May 2014, the Convention had 120 Parties and Range States, including Parties from northwest Africa and the Mediterranean countries. The Kemp's ridley is listed under Appendix I, which among several measures, calls upon Parties to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction. However, the Convention membership does not include Mexico and the United States. Additional information is available at http://www.cms.int.

> *Comment:* Are there reasons why Mexico and the U.S. are excluded? If so, please mention them in this 5-yr status review.

Sentence: The problems with existing international treaties are often that they have not realized their full potential, do not include some key countries, do not specifically address sea turtle conservation, are handicapped by the lack of a sovereign authority to enforce environmental regulations, and are not generally legally-binding.

> *Comment:* Do NOAA NMFS and USFWS really view the lack of foreign sovereignty over the U.S. and Mexico as a handicap? Are there any U.S. Constitutional issues regarding U.S. sovereignty involved here? Aren't Foreign countries able to protect Kemp's ridleys with their own environmental regulations and their enforcement, without having sovereignty over the U.S. and Mexico in this regard. The U.S. and Mexico seem to have been doing a pretty good job, as evidenced by the exponential increase in the Kemp's ridley population through 2009. The Kemp's ridley population could not have been growing exponentially at 19% per year, unless all sources of antropogenic mortality combined were insufficient to prevent it, at least until 2010.

Sentence: Notwithstanding the growing number of domestic and intergovernmental authorities, the Services believe that Kemp's ridley sea turtles remain in danger of extinction because of inadequacy of existing regulatory mechanisms for their protection.

> *Comment:* Are the Services concerned that the drop in nesting in 2010 and the current decline in the Kemp's ridley population resulted from inadequacy of existing regulatory mechanisms for their protection? If so, shouldn't these inadequacies be identified and listed in this 5-yr review?

Section 2.3.2.5

Sentence: The number of Kemp's ridley strandings in the northern Gulf of Mexico has been elevated in recent years, particularly in the Mississippi Sound and adjacent waters (Sea Turtle Stranding and Salvage Network data, http://www.sefsc.noaa.gov/species/turtles/strandings.htm).

> *Comment:* State specifically which years; for example, 2010-2014. Levels of strandings prior to 2010. coupled with all combined anthropogenic causes mortality of Kemp's ridleys, were insufficient to prevent the observed exponential increase in the Kemp's ridley population through 2009. Growth, especially exponential growth, of a population is impossible if losses to the population exceed additions to the population (Heppell et al. 2005, 2007). Therefore, exponential growth of the Kemp's ridley population since 1985 is more than sufficient evidence that additions attributable to conservation efforts overwhelmed losses through 2009. However, this changed in 2010, signaling that losses exceeded additions in that year. Declines in 2013 and 2014 suggest that losses continue to exceed additions.

Sentence: In response to these strandings, and due to speculation that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fishery during the summer of 2012. During May-July, observers reported 24 sea turtle interactions in the skimmer trawl fishery, all but one of which were identified as Kemp's ridleys (NMFS 2014). Thus, Kemp's ridleys were the most common species being taken in the skimmer trawl fishery, and it is reasonable to anticipate other nearshore fisheries would interact with them as well (see *Fisheries Interactions* discussion below). Given strandings typically represent only a small fraction of actual mortality, these stranding events, regardless of their source, potentially represent a serious impact to the recovery and survival of the Kemp's ridley.

> *Comment:* Have there been no surveys of Kemp's ridley mortality caused by skimmer trawls? If there have been such surveys, and mortalities were documented, then the reports and publications should be cited in this 5-yr review. A conclusion of potentially serious impact should be based on scientific evidence (best available data and information), not speculation. Five years have lapsed since the DWH oil spill; if skimmer trawling were a significant threat, NMFS should have some evidence of the magnitude of that threat, and it should be presented in this 5-yr review.

Sentence: Kemp's ridleys have the highest rate of interaction with fisheries operating in the Gulf of Mexico and Atlantic Ocean than any other species of turtle (Finkbeiner *et al.* 2011).

> *Comment:* The levels of annual Kemp's ridley deaths attributable to interaction with fisheries operating in the Gulf of Mexico and Atlantic Ocean should be tabulated in this 5-yr review. See Table 5 in Finkbeiner et al. (2011).Also, see, discuss, and cite: Wallace, B. P., C. Y. Kot, A. D. DiMatteo, T. Lee, L. B. Crowder, and R. L. Lewison. 2013. Impacts of fisheries bycatch on marine turtle populations worldwide: toward conservation and research priorities. Ecosphere 4(3):40.
> http://www.esajournals.org/doi/pdf/10.1890/ES12-00388.1

Sentence: The shrimp fishery has declined over the last couple of decades due to many factors including rising fuel and insurance costs (Caillouet *et al.* 2008).

> *Comment:* Here is what Caillouet et al. (2008) wrote about the decline in the shrimp fishery, which includes additional factors which ought to be mentioned in this 5-yr review, with accompanying citations giving credit to the sources cited in Caillouet et al. (2008): "In April 2005, the GMFMC[5,6] acknowledged that the U.S. shrimping industry in the northern Gulf of Mexico EEZ was experiencing serious economic problems, attributing them to increased fuel costs and competition from imported shrimp (Keithly and Roberts, 2000). According to a July 2007 report to the U.S. Congress,[2] hurricanes Katrina (August 2005), Rita (September 2005), and Wilma (October 2005) accelerated the regional decline in shrimp fishery participation and production which began in 2001. This regional decline was influenced by high fuel costs, poor market prices for domestic shrimp, fishery overcapitalization, rising insurance costs, and the erosion and conversion of waterfront property in some areas from fishing industry use to tourism-based and alternative uses.[2] In addition, while these hurricanes caused substantial damage and loss to the harvesting and processing sectors of the shrimp industry, thereby further reducing fleet size and fishing effort, they apparently had no detrimental impacts on Gulf shrimp stocks. Finally, a temporary moratorium on fleet size in the EEZ, proposed in 2005 by the GMFMC,[5,6] was approved by the U.S. Secretary of Commerce in September 2006."
> Nonetheless, the fishery is estimated each year to interact with 430,787 Kemp's ridleys of

which 76,954 are captured and almost 60% (44,247) are killed (all gear combined otter trawl, skimmer trawl, try nets) (NMFS 2014, Table 39). However, these estimates are highly uncertain because they assume that catch per unit effort (CPUE) and Kemp's ridley population growth rate are linearly related which is of questionable validity. Comments: If the annual Kemp's ridley population size were 1 million in 2009, this estimated annual kill would represent 4.4% of the population. But, this is not the only thing that should be recognized and acknowledged in this 5-yr review concerning annual kill by all shrimping gears combined. Conclusions of Section 7 consultations in 2012 and 2014 should also be included here. In addition, the well-established concept that the Kemp's ridley population could not have been increasing exponentially for more than three decades, had losses to the population from all anthropogenic and natural sources not been overwhelmed by additions to the population (Heppell et al. 2007; Caillouet 2006, 2010). CPUE for incidental capture of Kemp's ridleys in the shrimp fishery would be expected to be related to size of the post-pelagic Kemp's ridley population, not the estimated growth rate of the population. The estimated growth rate of the population has increased gradually over the years since 1985, but population size itself has grown exponentially! NMFS should examine the relationship between CPUE and population size index (annual nests at the three index beaches in Tamaulipas).

Sentence: Bycatch of Kemp's ridleys in bottom otter trawls also occurs in the mid-Atlantic generally off Virginia and south (Epperly *et al*. 1995, 1996; Haas 2010). Gill net fisheries operating along the mid and southeast U.S. Atlantic coastlines are known to incidentally capture Kemp's ridleys (Byrd *et al.* 2011; Finkbeiner *et al*. 2011; McClellan *et al.* 2009, 2011; Murray 2009; Snoddy and Williard 2010; Snoddy *et al.* 2009; TEWG 2000; Trent *et al*. 1997). Kemp's ridleys are caught in pound nets. Conservation actions include modified leaders in Chesapeake Bay, VA (71 FR 36024 June 23, 2006), which appear to reduce interactions with Kemp's ridleys (Silva *et al.* 2011). Although there are records of Kemp's ridley captures by longline fisheries (TEWG 2000, Fairfield-Walsh and Garrison 2007), the impact appears minimal. From 1992-1997, observers on the U.S. longline fleet documented the capture of 4,808 loggerheads, but no Kemp's ridleys (Witzell 1999).

Comment: The relative importance (to the overall Kemp's ridley population) of losses in the Atlantic due to all causes, is dependent on numbers of Kemp's ridley that return to the Gulf of Mexico from the Atlantic. In other words, if the contribution of Atlantic expatriots to the overall population of Kemp's ridleys in the Gulf of Mexico is small, losses in the Atlantic may be inconsequential. It is extremely important that large scale mark-recpature experiments be conducted to determine, once and for all, the relative contribution of Kemp's ridleys in the Atlantic to the population in the Gulf of Mexico. See, cite, and discuss recommendations by Eckert et al. (1994) for mass-tagging Kemp's ridleys: http://www.nmfs.noaa.gov/pr/pdfs/species/kempsridley_headstart.pdf

Sentence: Hooked turtles have been reported by the public fishing from boats, piers, and the beach (Cannon *et al.* 1994, TEWG 2000).

Comment: Large numbers of Kemp's ridleys were caught annually from recreational fishing piers in Mississipp during ,2010, 2011, 2013 and 2014, as well as in 2011, and these certainly should be mentioned in this 5-yr review.

Sentence: .An estimated 100 adult Kemp's ridley sea turtles were found stranded along the Tamaulipas coast during the month of March 2007 and suspected to be from the shark fishery (P. Burchfield, Gladys Porter Zoo, personal communication, 2007).

> *Comment*: The Gladys Porter Zoo Annual Reports for years 2009-2014 should be cited, as at least some of them include information on strandings, and mention various fisheries operating near the Tamaulipas nesting beaches. NMFS and USFWS are partners in the bi-national Kemp's ridley restoration and enhancement program, and USFWS has funded US participation in the conservation and research work in Tamaulipas since the program began in 1978. Therefore, details concerning annual Kemp's ridley strandings near the Tamaulipas nesting beaches and the sizes of these turtles ought to be available to NMFS and USFWS, and published. Gladys Porter Zoo annual reports on the bi-national program often state that these stranded turtles are mostly found offshore in an advanced state of decomposition, implying that they have died offshore. This begs the question of causes of their mortality.

Sentence: As global temperatures continue to increase, so will sand temperatures, which in turn will alter the thermal regime of incubating nests and alter natural sex ratios within hatchling cohorts (Glen and Mrosovsky 2004; Hawkes *et al.* 2007, 2009).

> *Comment:* Cite and discuss the following two relevant papers: MROSOVSKY, N. & M.H. GODFREY. 2010. Editorial: Thoughts on climate change and sex ratio of sea turtles. Marine Turtle Newsletter 128:7-11. http://www.seaturtle.org/mtn/PDF/MTN128.pdf Caillouet (2012): Editorial: Do Male-Producing Kemp's Ridley Nesting Beaches Exist North of Tamaulipas, Mexico? http://www.seaturtle.org/mtn/PDF/MTN134.pdf

Sentence: The pending sea level rise from global warming is a potential problem, particularly for areas with low-lying beaches where sand depth is a limiting factor, as the sea will inundate nesting sites and decrease available nesting habitat (Baker *et al*. 2006; Daniels *et al*. 1993; Fish *et al*. 2005; reviewed by Hamann *et al.* 2013; Poloczanska *et al.* 2009).

> *Comment:* Because the impacts of global warming on Kemp's ridley (etc.) seem impossible to avoid, what recovery actions do NMFS et al. (2011), NMFS, and USFWS recommend as assuage these impacts over future years, to assure Kemp's ridley recovery.

Sentence: In addition, shrimp trawlers have been employed to capture and relocate sea turtles prior to or during dredging operations.

> *Comment:* Have Kemp's ridley catch rates by such shrimp trawlers been evaluated and published? This is a very valuable potential source of information on shrimp trawler bycatch of Kemp's ridleys, including information on when, where, and how many are captured and relocated, and whether they were tagged before release, whether any were recaptured multiple times. http://sero.nmfs.noaa.gov/protected_resources/section_7/freq_biop/documents/dredge_bo/nov_19_2003_gom_rbo.pdf

Sentence: Exposure to heavy metals and other contaminants in the marine environment is also of concern. In addition to other sources of contaminants, coastal runoff has the potential to pollute shallow coastal habitats used by Kemp's ridleys. Kemp's ridleys are known to bioaccumulate a variety of toxins including organochlorine compounds and heavy metals (Gardner *et al*. 2006; Innis *et al.* 2008; Keller *et al* 2004, 2005; Kenyon *et al*. 2001; Lake *et al*. 1994; Pugh and Becker 2001; Rybitski *et al*. 1995; Wang *et al*. 2003).

> *Comment*: See, cite, and discuss relevant papers on exposure of Kemp's ridleys and other sea turtles to heavy metals and other contaminants in: http://texasseagrant.org/assets/uploads/resources/14-101_SIKRSTS_program.pdfhttp://texasseagrant.org/assets/uploads/resources/15-101_Monitoring_Status_program.pdf http://www.seaturtlesociety.com/bookofabstracts.pdfAlso see, cite, and discuss relevant abstracts on exposure of Kemp's ridleys and other sea turtles to heavy metals and other contaminants in: http://www.seaturtlesociety.com/bookofabstracts.pdf

Sentence: Kemp's ridleys are susceptible to cold stunning, a natural phenomenon, in which turtles become incapacitated as a result of rapidly dropping water temperatures (Morreale *et al*. 1992).

> *Comment:* See, cite, and discuss: Caillouet, C.W., Jr. 2012. Editorial: Does Delayed Mortality Occur in Sea Turtles That Aspirate Seawater into Their Lungs During Forced Submergence or Cold Stunning? Marine Turtle Newsletter 135:1-4. http://www.seaturtle.org/mtn/archives/mtn135/mtn135p1.shtml

<u>Section 2.4</u>

Sentence: The updated population model could only attain a best fit to the observed nests since 2009 by applying an unreasonable decrease in annual survival rates of immature and adult turtles, resulting in a population decline of over 40% per year.

> *Comments:* Was this the model in NMFS et al. (2011), or a different model? If different, it is essential that a detailed explanation be given in this 5-yr review of how it was updated. For example, what annual time series of nests and hatchlings were modeled, and what were the assumed vital rates? BTW, after peer-review of the draft of NMFS (2007, the current 5-yr review), responses to some peer-reviewers' comments were that a 5-yr review was not meant to provide new analyses; rather, it was supposed to review existing information and analyses. This would suggest that the updated model applied in this 5-yr review must be cited in some way; e.g., as published, or if not, this new model should be explained in detail, and a comparison made with the demographic model used in NMFS et al. (2011). What was the scientific basis for determining that decreases in annual survival rates necessary to the best fit of the updated model to post-2009 observed annual nests were "unreasonable", and what were their specific levels? A 40% decline in annual nests is not trivial, and it likely the result of unprecedented drops in survival rates of adult females, and subadult females that matured following the end of the nesting season in 2009; see Caillouet (2011, 2014) for a possible explanation.

Sentence: The results indicate the population is not recovering and cannot meet recovery goals unless survival rates improve (see section 2.3.1).

> *Comment:* This really begs the question of what caused survival rates to drop precipitously in 2010, and not to rebound thereafter. There should be something said in this 5-yr review about the critical need to determine the cause or causes of the apparent major decrease in survival rates in 2010, and perhaps thereafter. This is a huge and

important question. Aren't there any publications, reports, etc. that give some hints about the cause or causes of these drops in survival rates? If so, please list, cite, and discuss them in detail.

Sentence: The DWH oil spill that occurred at the onset of the 2010 nesting season and exposed Kemp's ridleys to oil in nearshore and offshore habitats may have been a factor in fewer females nesting in 2010, 2013, and 2014, but causal links are untested. The long-term impacts from the DWH oil spill and response to the spill (e.g., dispersants) to sea turtles as a result of habitat impacts and prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known.

Comments: This is a very good place to cite all the papers that have offered hypotheses or theories on why numbers of annual nests dropped in 2010, 2013 and 2014. Please cite and discuss them in this 5-yr review. Direct and high levels of mortality of adult females and subadult females is a very compelling hypothesis (see Caillouet 2014). This is a good place to state all the studies that NOAA, NRDA, and others have been conducting since 2010 to determine the impact of the DWH oil spill and responses to it.

Sentence: There are numerous well-understood national and bi-national steps that, with increased resources, can be taken to change the recovery outlook for this species. FWS recommends retaining its 2C classification because…

Comment: List them. One should be that FWS fully restore its annual funding for conservation efforts and research in Tamaulipas.

Section 4

Sentence: continue funding by the major funding institutions at a level of support needed to run the successful turtle camps in the State of Tamaulipas, Mexico, in order to continue the high level of hatchling production and nesting female protection;

Comment: Be more specific. What are the major funding "institutions?" Name them. FWS is a U.S. federal government agency; should it be called an "institution?" FWS should fully restore its annual funding for the work in Tamaulipas

Sentence: collect data on vital rates starting in the 2015 season, and for the next 5 years, including clutch frequency, remigration intervals, growth and mortality rates, recruitment into the breeding population, age distribution at first nesting, and oceanic temperature influences on fecundity. These data are needed to better assess nesting trends in the future and to better inform recovery actions.

Comment: A published agreement between BP and NRDA established that BP will provide $45,000,000, for 10 years, to support conservation efforts in Texas and Tamaulipas.